

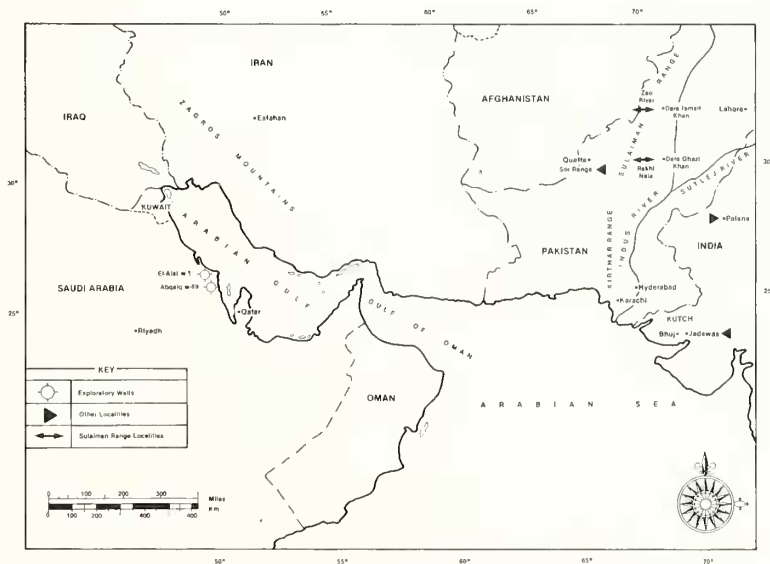
A NEW TRACHYLEBERID OSTRACOD GENUS FROM THE EARLY TERTIARY OF WESTERN ASIA

by QADEER A. SIDDIQUI and ALI A. F. AL-FURAIH

ABSTRACT. A new trachyleberid ostracod genus, *Schizoptocythere*, is proposed for ten species from the early Tertiary of Saudi Arabia, Pakistan, and India. The genus is characterized by possessing strongly protruding eye-tubercles, which usually bear an extra tubercle or spine posteriorly. Nine species of the genus are described, including seven new species: *Schizoptocythere circumspinoso*, *S. lissos*, *S. torquata*, *S. temperata*, *S. taurus*, *S. simopyge*, and *S. ventricosa*.

WHILE working on early Tertiary ostracods from Pakistan, Siddiqui found a group of closely related species having a very distinctive eye-tubercle, superficially resembling a split eye, and seemingly belonging to a new genus. These were referred to as Genus B by Siddiqui (1971, table 4; that paper also gives stratigraphic details of the Pakistan localities). Because all the specimens found were closed carapaces, no attempt was then made to describe the new genus.

Other species that appear to belong in this new genus include the following: *Exophthalmocythere ventronodosa*, described by Sohn (1970) from the Lower Eocene of Sind, Pakistan; '*Archicythereis howei*', described by Khosla (1972) from the Lower Eocene of Rajasthan, India; a new species (first noticed by Q.A.S.) from the Middle Eocene of Kutch, India, and three new species from the Palaeocene of eastern Saudi Arabia. The latter species which were shown to Siddiqui by Al-Furaih, are from Arabian American Oil Company wells located as follows: El-Alat W-1, lat. 26° 28' N., long. 49° 50' E.; Abqaiq W-69, lat. 26° 22' N., long. 49° 50' E. (text-fig. 1).



TEXT-FIG. 1. Map to show fossil localities of *Schizoptocythere* species in Saudi Arabia, Pakistan, and India.

All the specimens described in this paper are deposited in the British Museum (Natural History) London, and the specimen numbers quoted are those identifying them in the fossil ostracod collection of that institution.

SYSTEMATIC PALAEOLOGY

- Subclass OSTRACODA Latreille, 1806
 Order PODOCOPIDA Müller, 1894
 Suborder PODOCOPINA Sars, 1866
 Superfamily CYTHERACEA Baird, 1850
 Family TRACHYLEBERIDIDAE Sylvester-Bradley, 1948
 Subfamily TRACHYLEBERIDINAE Sylvester-Bradley, 1948
 Genus SCHIZOPTOCYTHERE nov.

Derivation of name. Greek *schizo*, split + *optos*, visible; with references to the split eye-tubercle + *cythere*. Gender, feminine.

Diagnosis. Genus of Trachyleberidinae with a strongly protruding eye-tubercle; in most species this bears an extra spine or tubercle above and behind its culmination, having the appearance of being split-eyed. Carapace very compressed, subrectangular in lateral view with a ventro-lateral expansion or swelling. Left valve with postero-dorsal process terminating in a spine in some species. Hinge holamphidont.

Type species. *Schizoptocythere circumspinos*a sp. nov.

Stratigraphic range. Upper Cretaceous?, Palaeocene to Middle Eocene, Upper Eocene?

Remarks. *Parexophthalmocythere* Oertli, 1959, resembles the present genus closely but has a merodont rather than an amphidont hinge. *Exophthalmocythere* Triebel, 1938, differs from *Schizoptocythere* in having a pitted surface and a subrectangular outline in lateral view.

The following species are included in *Schizoptocythere*:

- Schizoptocythere circumspinos*a sp. nov. Lower Palaeocene, Saudi Arabia; herein designated the type species.
- S. lissos* sp. nov. Upper Palaeocene, Saudi Arabia.
- S. torquata* sp. nov. Lower Palaeocene, Saudi Arabia.
- S. sp.*, aff. *S. howei* (Khosla, 1972). Upper Palaeocene, Pakistan.
- S. ventronodosa* (Sohn, 1970) Lower Eocene, Pakistan.
- S. temperata* sp. nov. Lower Eocene, Pakistan.
- S. taurus* sp. nov. Lower Eocene, Pakistan.
- S. simopyge* sp. nov. Middle Eocene, Pakistan.
- S. howei* (Khosla, 1972) Lower Eocene, India.
- S. ventricosa* sp. nov. Middle Eocene, India.

Species at least superficially similar to *Schizoptocythere* have been illustrated from the Palaeocene and Upper Cretaceous of West Africa by Reyment (1963) and Khan (1970). It is quite possible, if not probable, that these will prove to be *Schizoptocythere*, but comparative material is not available for study at this time. In addition, several species that probably belong to *Schizoptocythere* occur in the Maastrichtian of Jamaica (specimens provided by J. E. Hazel, U.S. Geological Survey). However, studies of these are incomplete and no single valves showing internal features have been found. *Pterygocythereis compressa*, Campanian of Texas, U.S.A. described by Hazel and Paulson, 1964, is also probably related to *Schizoptocythere*, although not as closely as the Jamaican and West African species.

Schizoptocythere circumspinos sp. nov.

Plate 123, figs. 1-6

Diagnosis. *Schizoptocythere* with long marginal spines and faint arcuate sulcus behind subcentral node. Eye-tubercle very prominent, hemispherical and with short posterior spine.

Derivation of Name. Latin 'surrounded with spines'; with reference to the marginal spines.

Holotype. OS 5425, a male right valve (Pl. 123, figs. 1, 5).

Paratypes. OS 5426-27.

Material. Three specimens (one carapace and two valves) from Abqaiq W-69 from two horizons (depths 2180-2190 ft and 1780-1790 ft). One carapace from El-Alat W-1 from one horizon (depth 1884-1890 ft).

Type locality and horizon. Abqaiq W-69, sample 1780-1790 ft below the surface, Umm er Radhuma Formation, Lower Palaeocene.

Description. Carapace elongate, ventro-laterally inflated, subrectangular in left valve but subtriangular in right valve. Sexual dimorphism present, the presumed males longer in proportion than females. Anterior margin broadly rounded, posterior subtriangular. Dorsal margin curved, ventral margin slightly incurved anterior to the middle; both margins taper towards the posterior end. Left valve with a well-marked postero-dorsal process terminating in a spine (not preserved in all specimens). Greatest height in the ocular region, greatest length passes slightly below the mid-point. In dorsal view greatest thickness lies slightly posterior to the middle. Eye-tubercle very prominent, hemispherical and protruding. Shell surface with a few scattered tubercles or spines showing pores and a faint arcuate sulcus posterior to the subcentral tubercle. Anterior, posterior, dorsal, and ventral margins ornamented with fairly long spines; the posterior spines are the longest and the dorsal spines are upstanding and three to five in number. In internal view the valves are deep in the posterior third. Duplicature relatively narrow with well-marked flange groove in the right valve between the selvage and the flange. Muscle scars not known. Hinge holamphidont.

Dimensions (μm).

	Length	Height	Width
Holotype, male right valve, OS 5425	829	439	
Paratype, male left valve, OS 5426	829	463	
Paratype, female carapace, OS 5427	793	434	293

Remarks. *Schizoptocythere howei* (Khosla, 1972) from the Lower Eocene of Rajasthan, India, is somewhat similar to the present species but has a more prominent ventro-lateral swelling and less pronounced eye-tubercle. Moreover, it lacks the arcuate sulcus found in the present species. *S. torquata* sp. nov. is ornamented with marginal tubercles but *S. circumspinos* has long marginal spines. These two species also differ in carapace outline.

A single specimen of this species was also found in the Upper Cretaceous of Abqaiq W.-69. In view of the fact that only a single specimen has been recovered so far, the extension of the range of this species into the Upper Cretaceous should be taken with caution.

Schizoptocythere lissos sp. nov.

Plate 124, figs. 3, 4

Diagnosis. *Schizoptocythere* with almost smooth surface; small node below and behind marked postocular depression and row of low tubercles on dorsal margin.

Derivation. Greek *lissos*, smooth; with reference to the carapace.

Holotype. OS 5428 (Pl. 124, figs. 3, 4).

Material. Only the holotype is so far known.

Type locality and horizon. El-Alat W-1, sample 1275–1282 ft below the surface. Umm er Radhuma Formation, Upper Palaeocene.

Description. Carapace elongate, subtriangular in side view. Anterior margin broadly and obliquely rounded, posterior narrowly rounded; dorsal margin nearly straight, ventral margin slightly incurved anterior to the middle. Greatest height at the eye-tubercle, greatest length passes through mid-point. In dorsal view, carapace elliptical in shape with greatest width at mid-length. Posterior cardinal angle obtuse, well developed in left valve. Left valve slightly larger than right, over-reaching at the antero-ventral, ventral, and posterior margins and at the posterior cardinal angle. Eye tubercle distinct and rounded. Shell surface nearly smooth with a small node below and behind the conspicuous post-ocular depression and a row of tubercles (some indistinct) on the posterior two-thirds of the dorsal margin (better seen in dorsal view).

Dimensions (μm).

	Length	Height	Width
Holotype, carapace, OS 5428	756	415	268

Remarks. This species can easily be distinguished from other known species of the genus by its almost smooth surface and a marked post-ocular depression.

Schizoptocythere torquata sp. nov.

Plate 124, figs. 1, 2, 5, and 6

Diagnosis. *Schizoptocythere* with row of marginal tubercles. Shell surface ornamented with small scattered tubercles. Subcentral node more or less distinct.

Derivation of Name. Latin *torquata*, adorned with a necklace; with reference to the marginal tubercles.

Holotype. OS 5423, a male carapace (Pl. 124, figs. 2, 5, 6).

Paratype. OS 5424.

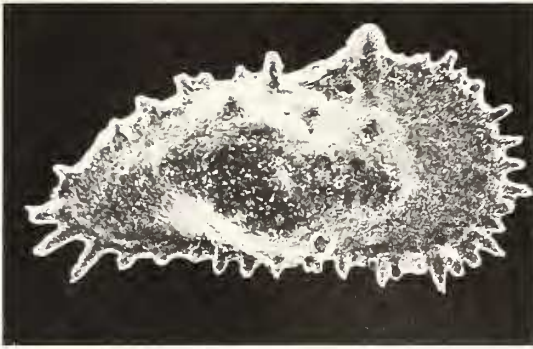
Material. Four carapaces from El-Alat W-1 from four horizons (depth 1934–2044 ft).

Type locality and horizon. El-Alat W-1, sample 2034–2044 ft below the surface. Umm er Radhuma Formation, Lower Palaeocene.

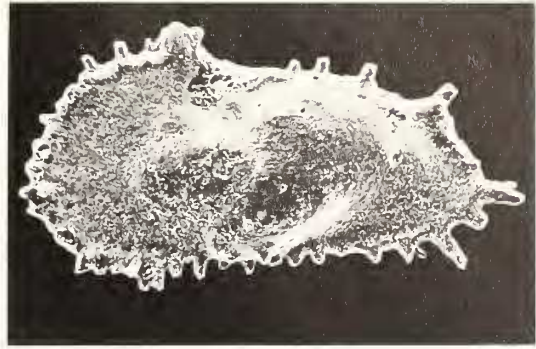
Description. Carapace (without eye-tubercle) subrectangular in lateral view. Sexual dimorphism observed, the presumed females are shorter and wider in proportion than the males. Anterior margin broadly rounded, postero-dorsal margin slightly concave, posterior extremity somewhat rounded, postero-ventral margin slightly curved. Dorsal and ventral margins almost straight (appearing sinuous in lateral outline because of marginal tubercles), tapering towards the posterior. Greatest length passes below mid-point, greatest height at the eye tubercle. Left valve over-reaches right valve slightly at the postero-dorsal corner. Shell surface tuberculate (the tubercles vary in prominence and are sparsely distributed). Subcentral-tubercle more or less distinct, posteriorly surrounded by a crescentic row of small pits (see Pl. 3 figs. 3, 4). Eye-tubercle prominent and with a small posterior tubercle (not present in all specimens). Anterior, ventral and posterior marginal rims ornamented with a row of tubercles; dorsal margin with 5–6 tubercles. Internal details not seen.

EXPLANATION OF PLATE 123

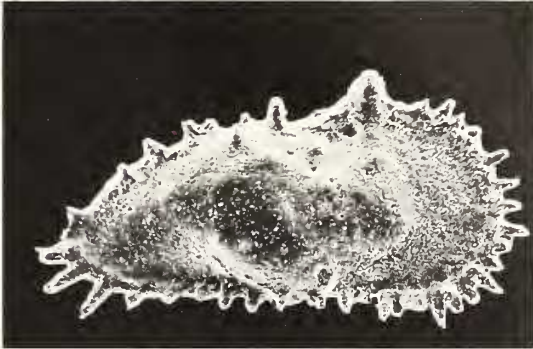
Figs. 1–6. *Schizoptocythere circumspinoso* sp. nov. 1, 2, 4, 5 Abqaiq W-69, sample 1780–1790 ft below the surface. Umm er Radhuma Formation, Lower Palaeocene. 1, 5. Stereo-pairs, holotype, male right valve, OS 5425. 1. External lateral view, $\times 74$. 5. Internal lateral view, $\times 74$. 2, 4. Paratype, male left valve, OS 5426. 2. External lateral view, $\times 75$. 4. Internal lateral view, $\times 74$. 3, 6. El-Alat W-1, Lower Palaeocene, paratype, female carapace, OS 5427. 3. Dorsal view, $\times 83$. 6. Ventral view, $\times 82$.



1a



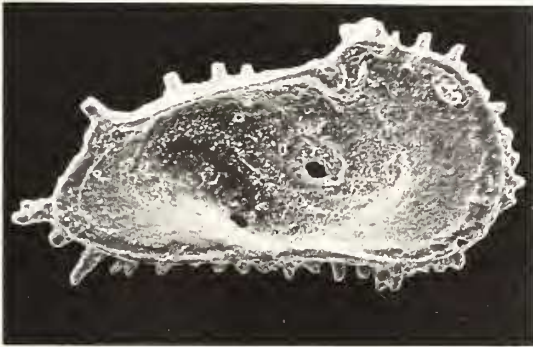
2



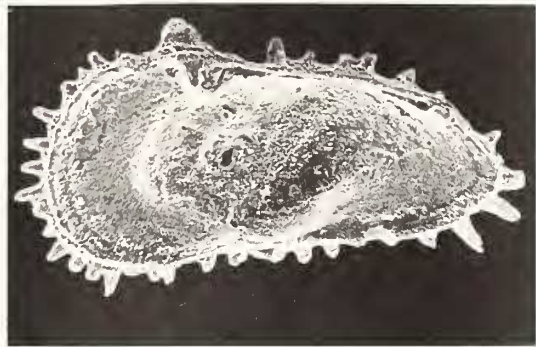
1b



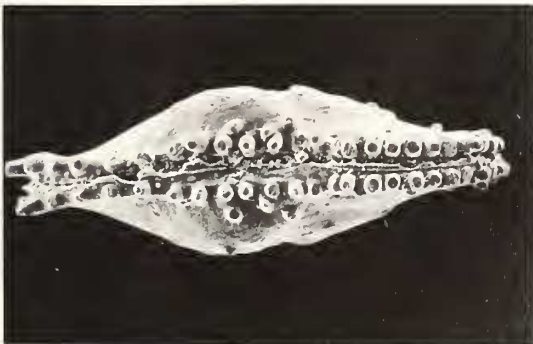
3



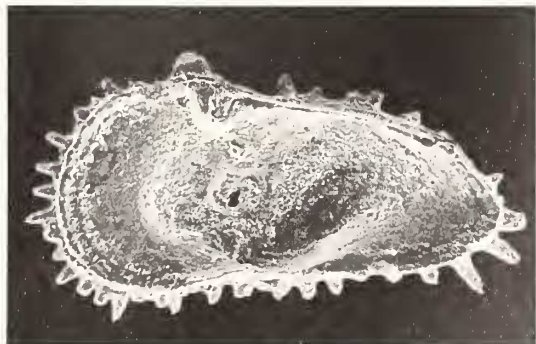
4



5a



6



5b

Dimensions (μm).

	Length	Height	Width
Holotype, male carapace OS 5423	805	439	268
Paratype, female carapace OS 5424	756	390	276

Remarks. There is considerable variation in the strength of the tubercles; the smoother forms show some resemblance to *S. lissos*. The present species differs from *S. circumspinoso* in having a subrectangular rather than subtriangular outline in the right valve. Moreover, the shell surface in the present species is tuberculate rather than spinose.

Schizoptocythere sp., aff. *S. howei* (Khosla, 1972)

Pl. 125, figs. 3, 5

Figured specimens. IO 5578-79.*Material.* Four specimens from the Sor Range from one horizon (sample no. 460J).*Locality and horizon.* Sor Range section, 8 miles east of Quetta, Pakistan. Upper Palaeocene.

Description. Carapace subtriangular to subrectangular. Sexual dimorphism apparent, the presumed males more elongate than the females and have a long posterior spine. Anterior margin broadly rounded, posterior subtriangular, dorsal and ventral margins almost straight, tapering towards the posterior end. Greatest height in the region of the eye-tubercle and greatest length passes through midpoint. Postero-dorsal process well-developed, probably terminating in a spine (only a hollow tubercle is seen in the specimens found). Shell surface smooth except for ventero-lateral node. Eye-tubercle conical and protruding. Anterior and posterior margins ornamented with spines, the male dimorph has a long posterior spine.

Dimensions (μm).

	Length	Height	Width
Female carapace, IO 5578	617	389	199
Male carapace, IO 5579	617	370	190

Remarks. The present form is similar to *S. howei* (Khosla, 1972) but has more prominent eye-tubercles and a less elongate carapace.

This is a rare ostracod and has so far been found only in the Upper Palaeocene of the Sor Range section.

Schizoptocythere temperata sp. nov.

Plate 125, figs. 1, 2

Diagnosis. Species of *Schizoptocythere* with more or less prominent eye-tubercles and distinct ventro-lateral swellings. Left valve with well-marked postero-dorsal process.

Derivation of name. Latin *temeratus*, moderate; referring to slight development of ornamentation when compared to *S. ventricosa*.

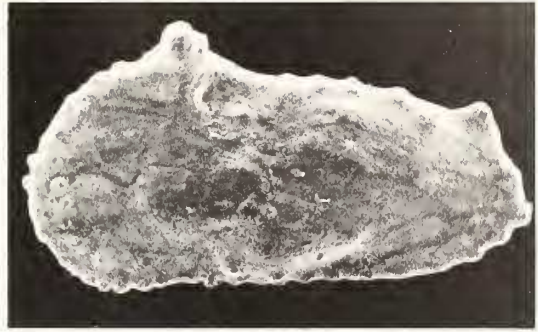
EXPLANATION OF PLATE 124

Figs. 1, 2, 5, 6. *Schizoptocythere torquata* sp. nov. El-Alat W-1, sample 2034-2044 ft below the surface. Umm er Radhuma Formation, Lower Palaeocene. 1. Paratype female carapace, OS 5424, lateral view from right, $\times 86$. 2, 5, 6. Holotype male carapace, OS 5423. 2. Lateral view from left, $\times 81$. 5. Stereo-pair, oblique lateral view from left, $\times 81$. 6. Oblique dorsal view, $\times 81$.

Figs. 3, 4. *Schizoptocythere lissos* sp. nov. El-Alat W-1, sample 1275-1282 ft below the surface. Umm er Radhuma Formation, Upper Palaeocene. 3, 4. Holotype, carapace, OS 5428. 3. Stereo-pair, lateral view from right, $\times 89$. 4. Dorsal view, $\times 89$.



1



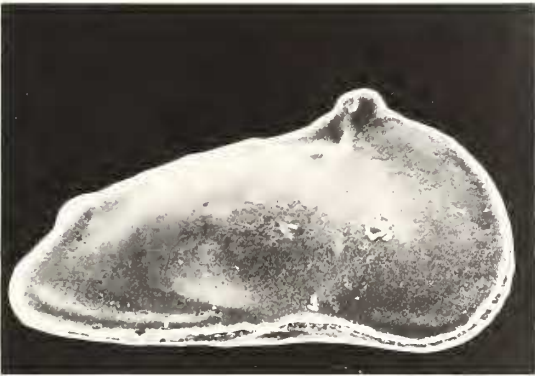
2



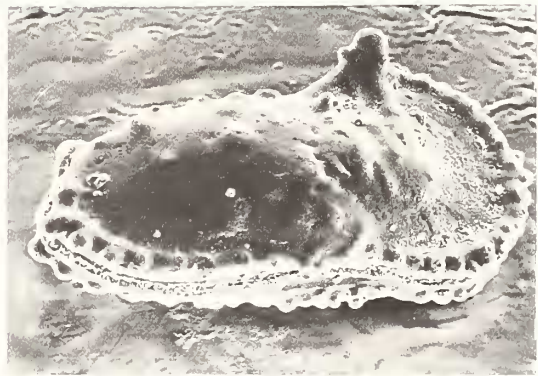
3a



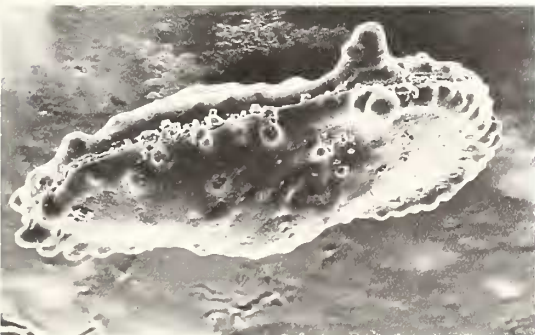
4



3b



5a



6



5b

Holotype. IO 5582, a male carapace (Pl. 125, fig. 1) from sample no. 3180.

Paratype. IO 5583.

Material. Thirty-five specimens from the Rakhi Nala section from fourteen horizons (sample nos. 3163, 3165, 3170, 3174, 3175, 3177, 3180, 3189 to 3191, 3403, 3409, 3428, and 3435).

Type locality and horizon. Green and Nodular Shales of the Rakhi Nala section, Sulaiman Range, Pakistan. Lower Eocene.

Description. Carapace subrectangular to subtriangular in side view. Sexual dimorphism apparent, the presumed males more elongate than the females. Ventro-lateral swelling distinct. Anterior margin broadly and obliquely rounded, postero-dorsal margin slightly concave, posterior extremity almost straight (better seen in specimens without posterior marginal spines). Dorsal and ventral margins nearly straight, tapering towards the posterior end. Greatest length passes below mid-point. In dorsal view, greatest width lies almost in the middle. Valves nearly equal. Postero-dorsal process well-marked, particularly in left valve (in some specimens it ends in a spine). Eye-tubercle more or less prominent. Shell surface smooth except for one or two tubercles including a mid-dorsal tubercle (present in some specimens). Anterior, ventral and posterior margins ornamented with short spines (not present in all specimens), the posterior spines being the most distinct. Internal features not seen.

Dimensions (μm).

	Length	Height	Width
Holotype, male carapace IO 5582	617	351	180
Paratype, female carapace IO 5583	570	332	190

Remarks. *Schizoptocythere ventronodosa* (Sohn, 1970) comb. nov. is a closely related ostracod, but has a subrectangular rather than subtriangular outline in lateral view.

This species occurs rarely in the Lower Eocene (Upper Rakhi Gaj Shales, Green and Nodular Shales and Rubbly Limestones) of the Rakhi Nala section.

Schizoptocythere taurus sp. nov.

Plate 125, figs. 4, 6

Diagnosis. *Schizoptocythere* with very prominent, subconical eye-tubercles.

Derivation of name. Latin *taurus*, a bull; from the fancied resemblance of the carapace in lateral view to the head of a bull.

Holotype. IO 5584, a female carapace (Pl. 125, fig. 4).

Paratype. IO 5585.

Material. Fourteen specimens from the Rakhi Nala section from one horizon (sample no. 3460).

Type locality and horizon. Shales with Alabaster, from the Rakhi Nala section, Sulaiman Range, Pakistan. Lower Eocene (upper part).

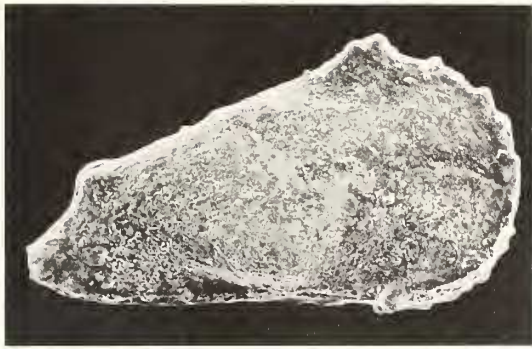
EXPLANATION OF PLATE 125

Figs. 1, 2. *Schizoptocythere temperata* sp. nov. Rakhi Nala section. Green and Nodular Shales, Lower Eocene.

1. Stereo-pair, holotype, male carapace, IO 5582, lateral view from right, $\times 105$. 2. Paratype, female carapace, IO 5583, lateral view from left, $\times 100$.

Figs. 3, 5. *Schizoptocythere* sp. aff. *S. howei* (Khosla, 1972). Sor Range, Upper Palaeocene. 3. Male carapace, IO 5579, lateral view from left, $\times 100$. 5, female carapace, IO 5578, lateral view from left, $\times 100$.

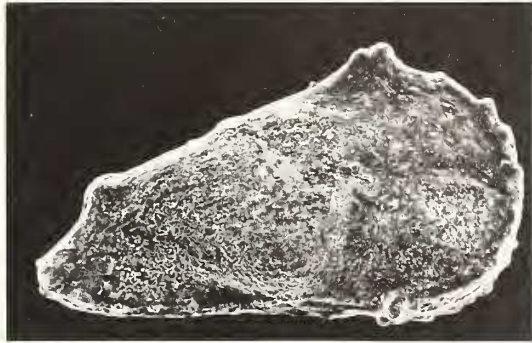
Figs. 4, 6. *Schizoptocythere taurus* sp. nov. Rakhi Nala section. Shales with Alabaster, Lower Eocene (upper part). 4. Stereo-pair, holotype, female carapace, IO 5584, lateral view from left, $\times 100$. 6. Paratype, male carapace, IO 5585, lateral view from left, $\times 106$.



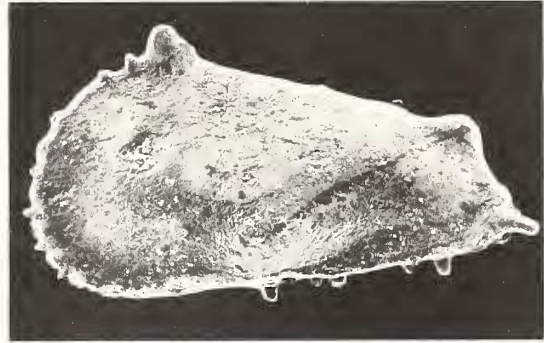
1a



2



1b



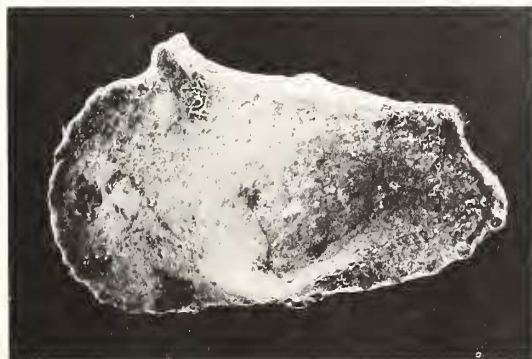
3



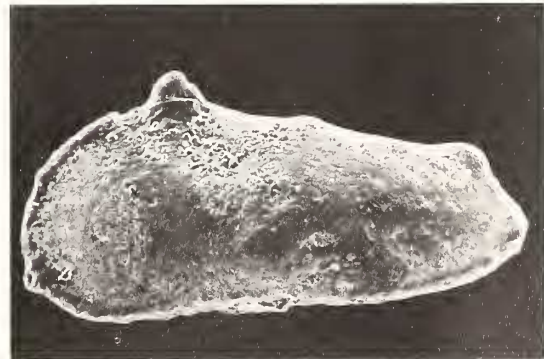
4a



5



4b



6

Description. Carapace subrectangular (excluding eye-tubercle) in lateral view, tapering slightly towards the posterior end. Strongly dimorphic, the male dimorphs being more elongate and less high than the females. Anterior margin broadly rounded, posterior subtriangular in the middle. Dorsal margin straight (appears slightly sinuous because of a mid-dorsal tubercle), ventral margin slightly incurved anterior to the middle. Greatest height in the ocular region and greatest length lies just below the middle. Posterior cardinal angle well marked. Shell surface smooth except for a tubercle situated almost in the middle of the dorsal margin. Eye-tubercle subconical and very prominent. Anterior and posterior margins ornamented with small tubercles. Internal characters not known.

Dimensions (μm).

	Length	Height	Width
Holotype, female carapace, IO 5584	598	351	228
Paratype, male carapace, IO 5585	617	332	199

Remarks. This species occurs in the Shales with Alabaster (Lower Eocene, upper part) of the Rakhi Nala. It occurs stratigraphically between *S. temperata* and *S. simopyge*. However, it can be differentiated from *S. temperata* by having very prominent eye-tubercles and from *S. simopyge* by lacking an upturned posterior end.

Schizoptocythere simopyge sp. nov.

Plate 126, figs. 1, 2

Diagnosis. *Schizoptocythere* in which posterior end is turned up towards the dorsal margin. Eye-tubercle very prominent and hemispherical.

Derivation of name. Greek *simoma*, turned up and *pyge*, tail; with reference to the posterior end of the carapace.

Holotype. IO 5586, a female carapace (Pl. 4, fig. 2) from sample no. 3499.

Paratype. IO 5587.

Material. Four specimens from the Rakhi Nala section from two horizons (sample nos. 3499 and 3613). One specimen from the Zao River section from one horizon (sample no. 24150).

Type locality and horizon. Lower Chocolate Clays, Kirthar Formation (lower part). Rakhi Nala section, Sulaiman Range, Pakistan. Middle Eocene.

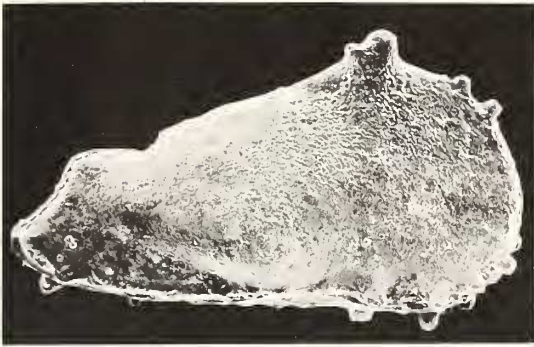
Description. Carapace ventrally inflated, subtriangular in male dimorph and subrectangular in the female. Sexual dimorphism marked, the males being more elongate than the females. Anterior margin broadly rounded, postero-ventral margin slightly concave, posterior extremity turned up towards the dorsal margin. Dorsal margin almost straight, ventral margin slightly concave anterior to the middle. Both dorsal and ventral margins taper posteriorly. Greatest height is in the ocular region and greatest length lies below the mid-point. Postero-dorsal process well developed, particularly in the left valve, ending in a tubercle. Left valve slightly over-reaches

EXPLANATION OF PLATE 126

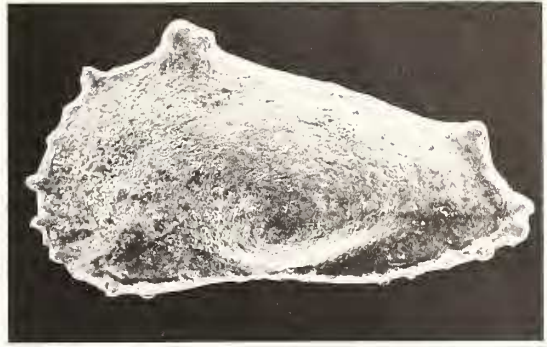
Figs. 1, 2. *Schizoptocythere simopyge* sp. nov. Rakhi Nala section, Lower Chocolate Clays, Kirthar Formation, Middle Eocene. 1. Paratype, male carapace, IO 5587, lateral view from right, $\times 128$. 2. Stereo-pair, holotype, female carapace, IO 5586, lateral view from left, $\times 124$.

Figs. 3, 4. *Schizoptocythere howei* (Khosla, 1972). One kilometer west of Palana, Bikaner District, Rajasthan. Grey Shales of the *Assilina granulosa* Zone, Lower Eocene. 3. Male carapace, IO 5581, lateral view from left, $\times 99$. 4. Female right valve, IO 5580, external lateral view, $\times 115$.

Figs. 5, 6. *Schizoptocythere ventricosa* sp. nov. Jadawas, Kutch. Kirthar Formation, Middle Eocene. 5. Stereo-pair, holotype, carapace, IO 5588, lateral view from left, $\times 103$. 6. Paratype, right valve, IO 5589, external lateral view, $\times 107$.



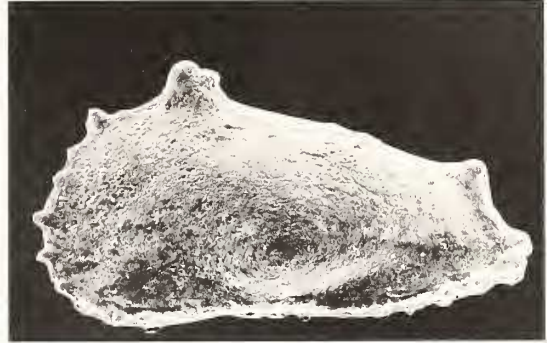
1



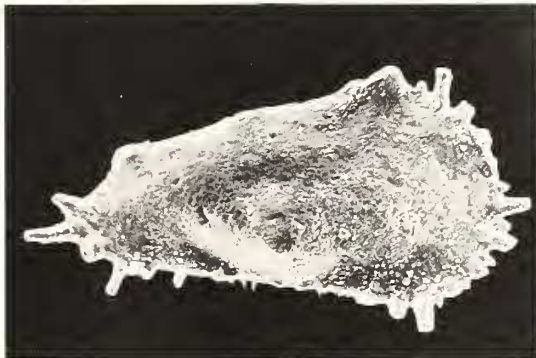
2a



3



2b



4



5a



6



5b

the right at the postero-dorsal margin. Shell surface nearly smooth. Eye-tubercle very prominent, hemispherical and with a small tubercle behind. Both anterior and posterior marginal areas compressed. Anterior, ventral and postero-ventral margins and posterior extremity decorated with spines. Internal features not known.

Dimensions (μm).

	Length	Height	Width
Holotype, female carapace, IO 5586	513	294	199
Paratype, male carapace, IO 5587	522	294	199

Remarks. The main character which distinguishes this species from other species of the genus is its upturned posterior. The female dimorphs of *Schizoptocythere* sp., aff. *S. howei* (Pl. 126, fig. 1) somewhat resemble the females of the present species but are less elongate and have the posterior extremity pointing dorsally.

This rare species has been found in the Kirthar Formation (Middle Eocene) of the Rakhi Nala and Zao River sections.

Schizoptocythere howei (Khosla, 1972) comb. nov.

Plate 126, figs. 3, 4

1972 '*Archicytheris*' *howei* Khosla, p. 487, pl. 2, figs. 7-8; pl. 4, fig. 3.

Diagnosis. A species of *Schizoptocythere* with eye-tubercles distinct but not prominent, ventro-lateral swellings very well developed.

Figured specimens. IO 5580-81

Material. Twenty specimens from the locality and horizon below, collected by Dr. S. C. Khosla.

Locality and horizon. One kilometer west of Palana, Bikaner District, Rajasthan, India. Grey Shales of the *Assilina granulosa* Zone. Lower Eocene.

Dimensions (μm).

	Length	Height	Width
Female right valve, IO 5580	579	332	
Male carapace, IO 5581	593	332	209

Remarks. According to Khosla, who described this species in detail, a considerable amount of variation is shown by this species, particularly in the number of spines present.

Schizoptocythere ventricosa sp. nov.

Plate 126, figs. 5, 6

Diagnosis. A species of the genus *Schizoptocythere* with very prominent ventro-lateral expansion. Anterior, ventral and posterior margins spinose. Eye-tubercle prominent with well-developed posterior tubercle. Postero-dorsal process well marked.

Derivation of name. Latin *ventricosus*, potbellied; with reference to the ventro-lateral expansion.

Holotype. IO 5588, a carapace (Pl. 4, fig. 5).

Paratype. IO 5589.

Material. Twenty-six specimens from Jadawas, Kutch from one horizon, sample no. J2b.

Type locality and horizon. Jadawas, approximately 90 miles east of Bhuj, Kutch, Middle Kirthar (lower part), Middle Eocene. Collected by the late Dr. K. K. Tandon.

Description. Carapace subtriangular in lateral view, with very prominent ventro-lateral expansion. Anterior margin broadly and obliquely rounded, posterior subtriangular. Dorsal margin almost straight, ventral margin slightly incurved anterior to the middle. Dorsal and ventral margins converge towards the posterior. Greatest

height is in the ocular region and greatest length lies below the mid-point. Both right and left valves have a postero-dorsal process ending in a well developed spine (broken in a few specimens). Shell surface smooth except for a few scattered tubercles and one to two spines near the dorsal margin (not present in all specimens). Anterior, ventral, and posterior margins ornamented with well-developed spines. Eye-tubercle prominent, with a well-marked tubercle behind it. Duplicature of moderate width with a subperipheral selvage. Line of concrescence and inner margin coincide throughout. Radial pore-canal not clearly seen. Hinge holamphidont.

Dimensions (µm).

	Length	Height	Width
Holotype, carapace, IO 5588	551	332	199
Paratype, right valve, IO 5589	541	313	

Remarks. This species resembles *S. ventronodosa* (Sohn, 1970) but has a more prominent ventro-lateral expansion and eye-tubercles. *S. simopyge*, which occurs in the Sulaiman Range at more or less the same stratigraphic level as the present species, has an upturned posterior end and less prominent ventro-lateral swelling.

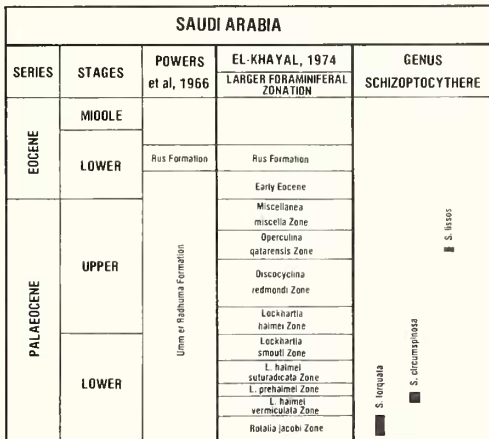
PALAEOECOLOGY

Schizoptocythere has been found associated with the ostracod genera *Alocopocythere*, *Cytherelloidea*, *Hermanites*, *Occultocythereis*, *Schizocythere*, *Trachyleberis*, *Uroleberis*, and *Xestoleberis*. Recent species of these genera mainly inhabit epi-neritic seas (Bate 1971; Van Morkhoven, 1963) and their occurrence with *Schizoptocythere* and with the larger foraminiferal genera *Assilina*, *Lockhartia*, *Operculina*, and *Nummulites* would indicate shallow warm water conditions.

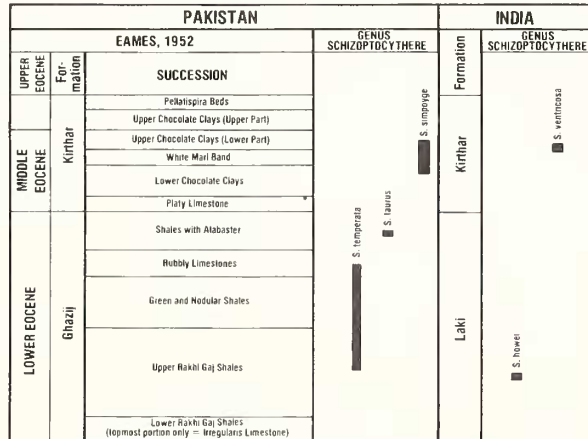
STRATIGRAPHIC OCCURRENCE

The three species from El-Alat W-1 in eastern Saudi Arabia occur in a stratigraphic sequence. *S. torquata* occurs in the Lower Palaeocene from 2034 to 1936 ft depth in the well. It is replaced by *S. circumspinoso*, 1884 to 1890 ft depth, in the upper part of the Lower Palaeocene. In the Upper Palaeocene the smooth form *S. lissos* appears (text-fig. 2).

Schizoptocythere sp., aff. *S. howei* occurs in the Upper Palaeocene of the Sor Range area of Pakistan and *S. ventronodosa* (Sohn, 1970) in the Lower Eocene (Meting Limestone) of the Hyderabad Division, Sind, Pakistan. In the Rakhi Nala section of the Sulaiman Range, three species



TEXT-FIG. 2. Stratigraphic ranges of *Schizoptocythere* species in the Palaeocene of Saudi Arabia.



TEXT-FIG. 3. Stratigraphic ranges of *Schizoptocythere* species in the Eocene of Pakistan and India.

are found in a stratigraphic succession. In the Lower Eocene (excepting the uppermost part) *S. temperata* occurs at several horizons. *S. taurus* replaces *S. temperata* in the uppermost part of the Lower Eocene and in turn is replaced by *S. simopyge* in the Middle Eocene. *S. simopyge* also occurs in the Zao River section of the northern Sulaiman Range at more or less the same biostratigraphic position as in the Rakhi Nala.

The two species of *Schizoptocythere* so far known from India are *S. howei* (Khosla, 1972) from the Lower Eocene (*Assilina granulosa* zone) of western Palana, Bikaner District, Rajasthan, and *S. ventricosa* from the Middle Eocene (Kirthar Formation) of Jadawas, Kutch (text-fig. 3).

Acknowledgements. The authors feel indebted to the late Professor P. C. Sylvester-Bradley formerly of Leicester University, England, where this work was begun. They are grateful to Dr. R. H. Bate of the British Museum (Natural History) and Dr. J. E. Hazel of the U.S. Geological Survey for reviewing the manuscript critically. Dr. Hazel also provided comparative material from the Jamaican Maastrichtian. Specimens of *S. ventricosa* were supplied to us by the late Dr. K. K. Tandon and those of *S. howei* by Dr. S. C. Khosla, both from India. This research, in part, was funded by the National Sciences and Engineering Research Council, Canada through a grant to one of us (Q.A.S.).

REFERENCES

- AL-FURAIH, A. A. F. 1980. Upper Cretaceous and Lower Tertiary Ostracoda (Superfamily CYTHERACEA) from Saudi Arabia. Publication of Riyadh University.
- BATE, R. H. 1971. The distribution of Recent Ostracoda in the Abu Dhabi Lagoon, Persian Gulf. *Bull. Centre Rech. Pau-SNPA Suppl.* **5**, 239–256.
- EAMES, F. E. 1952. A contribution to the study of the Eocene in western Pakistan and western India. *Quart. J. geol. Soc. Lond.* **107**, 159–200.
- EL-KHAYAL, A. A. 1974. Foraminiferal biostratigraphy of the Umm er Radhuma Formation (Palaeocene–Lower Eocene) of eastern Saudi Arabia. *Bull. Fac. Sci. Riyadh University*, **6**, 195–214, 5 figs.
- HAZEL, J. E. and PAULSON, O. L. JR. 1964. Some new ostracode species from the Austinian and Tayloran (Coniacian and Campanian) rocks of the East Texas Embayment. *J. Palaeont.* **38**, 1047–1064, pls. 157–159, 2 text-figs.
- KHAN, M. H. 1970. Cretaceous and Tertiary rocks of Ghana. *Ghana Geol. Surv. Bull.* **40**, 1–43.
- KHOSLA, S. C. 1972. Ostracodes from the Eocene beds of Rajasthan, India. *Micropaleontology*, **18**, 476–507, pls. 1–5.
- OERTLI, H. J. 1959. *Euryitocythere* und *Parexophthalmocythere*, zwei neue Ostrakoden-Gattungen aus der Unterkreide Westeuropas. *Paläontol. Z.* **33**, 241–246.
- POWERS, R. W. *et al.* 1966. Geology of the Arabian Peninsula (Sedimentary Geology of Saudi Arabia). *U.S. Geol. Surv. prof. Pap.* **560-D**, 1–147.
- REYMENT, R. A. 1963. Studies on Nigerian Upper Cretaceous and Lower Tertiary Ostracoda. *Stockh. Contrib. Geol.* **10**, 1–286, 23 pls.
- SIDDIQUI, Q. A. 1971. Early Tertiary Ostracoda of the family Trachyleberididae from West Pakistan. *Bull. Br. Mus. Nat. Hist. (Geol.) Suppl.* **9**, 1–98, 42 pls.
- SOHN, I. G. 1970. Early Tertiary Ostracodes from West Pakistan. *Mem. Geol. Surv. Pakist. Palaeont. Pakistanica*, **3**, 1–91, 4 pls.
- TRIEBEL, E. 1938. Ostracoden-Untersuchungen. 1. *Protocythere* und *Exophthalmocythere*, zwei neue Ostracoden-Gattungen aus der deutschen Kreide. *Senckenberg leth.* **20**, 179–200.
- VAN MORKHOVEN, F. P. C. M. 1963. Post-Palaeozoic Ostracoda. Vol. **2**, 478 pp. Elsevier Publishing Company, Amsterdam.

QADEER A. SIDDIQUI

Department of Geology
Saint Mary's University
Halifax, N.S., Canada

ALI A. F. AL-FURAIH

Department of Geology
University of Riyadh
Riyadh, Saudi Arabia

Typescript received 25 April 1980

Revised typescript received 9 October 1980